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Technical Notes

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SNOW CACHE SEEDLING STORAGE IN NORTHWESTERN ONTARIO

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INTRODUCTION

A snow cache is a practical means of field storage for fall-lifted, bareroot stock that utilizes snow cover and an insulating material. When properly constructed, snow caches can provide minimum temperature fluctuations and high humidity conditions which are essential to maintaining the physiological quality of the stock (Ryker et al. 1974).

Two types of snow caches have been used in northwestern Ontario, the pit snow cache and the culvert snow cache. The pit snow cache is the most common and easiest to construct and will be described here. The pit snow cache is essentially a clearing dug in the snow, filled with trees and covered with plastic, snow and an insulating material, usually woodchips or sawdust. A general pit snow cache design is outlined in Figure 1.

The culvert snow cache utilizes large culverts for seedling storage with the culvert being covered with snow and an insulating material. A general overview of culvert snow cache is provided but for further information the reader is referred to Dahlgreen et al. (1974).

WHY USE SNOW CACHES?

Snow caching is a means of keeping fall lifted, bareroot nursery stock at the planting site until required for outplanting. Snowing caching does have the potential to be used with container stock (Extended Greenhouse Culture crops), although this has not been practised operationally in northwestern Ontario. Snow caches were originally used in northwestern Ontario to ensure a supply of high quality planting stock to winter cut areas that experience problems with spring access. Although still used for this purpose, more recently snow caches have been used to alleviate spring shortages of cold storage space at the nursery and to ensure that the maximum number of bare root seedlings are fall lifted. In addition, snow caches can be used where mobile refrigeration units are in short supply during the spring shipping season.

WHERE TO USE SNOW CACHES

Snow caches can be constructed at most planting sites depending upon need, the size of the planting program and the availability of nursery cold storage. Priority should be be given to constructing snow caches for winter cut, inaccessible areas to ease spring supply problems to the site.

Sites for snow cache construction should be selected in the fall prior to outplanting. The site must be convenient to winter transportation routes ie. ploughed winter road. The site should be well drained and level or on a slight rise; avoid low depressions where water could sit in the spring after snow melt. Consider locating the cache close to a water source for watering purposes, if possible. A preferred site is in open shade with a slight

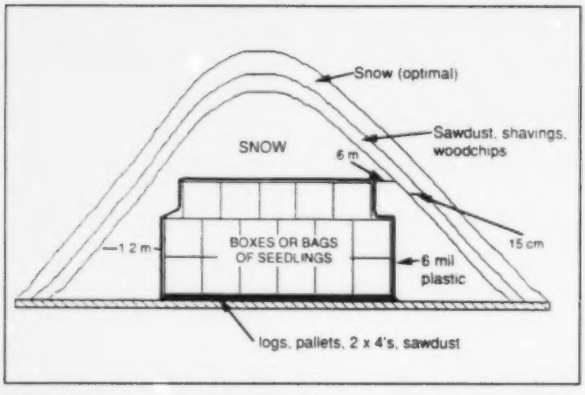

Figure 1: Cross-secton of typical pit snow cache after construction

northerly slope (Dahlgreen et al. 1974). Orient the cache so that it can be opened on the north side. Select a site that a reefer can back onto and preferably one that will accommodate trucks in the spring; if possible, the site should be accessible year round.

If a large number of trees are to be stored, consider making a number of smaller caches; possibly one cache for every five (5) days of planting.

WHEN TO BUILD SNOW CACHES

Snow caches are usually planned for construction in early to mid-February when snow depths are adequate and minimal winter temperatures have passed. The temperature when the cache is to be constructed should just be below freezing (-15 to -5° C); avoid extremely cold days. Temperatures above - 5° C often cause surface snow to become heavy and lumpy, causing difficulty in covering poly kraft bags.

HOW TO BUILD A SNOW CACHE

1. Snow Pit Caches

The success of a snow cache can depend on advance planning and arrangements for equipment, labour and trees prior to cache construction. The snow cache site and access roads should be cleared just prior to the arrival of the trees.

A corridor 2.5 to 3.0 meters in width should be dug out in a single pass in the middle of the snow cache site. The length will depend upon the number of trees to be stored. Clear out the entrance corners of the corridor to allow a reefer to back in.

Back the reefer into the corridor. Start cache construction and move the tractor trailer ahead as the cache construction progresses.

The bottom of the cache is lined with logs, poles, pallets, studs or sawdust depending upon availability and cost. This will elevate (15 cm) the bags or boxes of trees off the ground and avoid any chance of them getting partially submerged in the spring. If the ground is extremely frozen, sawdust (3 to 8 cm) can be used to insulate the frozen ground in order to keep the temperature at a more constant level.

The bags or boxes of seedlings are placed on top of the wood (logs, pallets etc.). The bags or boxes can be up to six wide but **do not** pile more than three containers high. Insert the thermocoupler into selectively placed bags or boxes of trees for temperature monitoring.

Cover the top and sides (not the bottom) of the pile of trees with six mil plastic.

Cover the cache with snow from both sides of the corridor. The entire pile must be covered with at least 0.6 m of snow. There should be 1.2 m or more of snow on the sides. The corners and top edges are the spots where it is hardest to get proper coverage, so take care to cover properly.

Cover the snow with sawdust, shavings or woodchips (insulating materials) to a depth of at least 15 cm. Once again, insure covering the corners. Each box or bag snow cached will require about .23 m^3 of sawdust. A rule of thumb is that one reefer load of tree seedlings requires one 13.7 m trailer load of sawdust, chips etc.

Snow may be placed over the sawdust to prevent the wind from blowing it; this step is optional.

Place a marker (usually a pole or post) at both ends of the cache to assist the operator in construction.

Paint or flag the marker on the north side of the cache to indicate the spot the cache will be opened when planting begins.

Materials and Equipment Requirements

1. Front end loader or tractor - for covering cache with snow and sawdust;
2. Sawdust, shaving or woodchips - trucked to site;
3. Poles, skids or 2 x 4's for base of cache;
4. Plastic;
5. Temperature monitoring equipment;
6. Snow shovels and rakes;
7. Staff - 4 to 7 people to unload truck, build cache;
8. Vehicles - one or two trucks;

2. CULVERT SNOW CACHES

Culvert snow caches are not commonly used in northwestern Ontario, as they generally take more time to construct and offer little advantage over a pit snow cache. The general construction procedure can be summarized as follows:

- use 1.5 m diameter culverts, either 4 or 6 m in length.
- once the cache location has been determined, the culvert can be placed weeks in advance of cache construction. Remember to keep the ends of the culvert open.
- plough a single lane just slightly wider than the culvert for culvert placement in a north - south direction.
- place the culvert on raised logs or beams to stop water seepage.
- place 2 x 4's on the bottom of the culvert to support the bags/boxes of trees to keep them out of water.
- stack bags of trees up to three bags high.
- construct a second tier by wedging wooden pallets above the first tier. The pallets must not rest on the bags of the first tier. Place bags of trees on the second tier of pallets.
- cover ends with plastic to prevent water seepage.
- cover each end with a sheet of plywood.
- cover with snow and sawdust, shaving or woodchips as you would with a pit snow cache.

Red Lake District has had experience with culvert snow caches.

COSTS

The average cost (1987) for snow cache construction is approximately $20.00 per thousand seedlings, of which about 80% is for supplies and service and 20% for salary. The cost will vary depending upon the size and number of snow caches and the distance to haul sawdust and equipment to the site. The costs can range from a low of $15.00 per thousand with a large program that is close to a work centre to a high of $30.00 per thousand where a number of small caches are scattered throughout the planting area.

OPENING A SNOW CACHE

Open the cache from the north end and proceed inwards. Always mark the location of the opening.

Remove seedlings from the snow cache twenty-four (24) hours prior (forty-eight (48) hours prior if cold weather prevails) to planting, and set them in a cool shaded location (consider the use of reflective tarps). This time is required to allow the trees to thaw and acclimatize prior to planting.

Always cover opening back in after removing seedlings from the cache, so that the trees remaining in the cache are protected.

OUTPLANTING PERFORMANCE

Under favourable conditions, fall lifted, bareroot stock stored in a properly constructed snow cache can perform as well as spring-lifted, cold stored stock and fresh lifted stock (Racey and Hutchison 1983). Snow caches can be effectively used for field storage well into the month of June in northwestern Ontario.

Tips and Suggestions

- Large, centralized snow caches are more cost effective, but there is an increased risk if the cache is not properly constructed.
- With large snow caches, the cache should be divided into cells with 1 to 2 m of snow between each cell. For example in Thunder Bay district, each cell contains up to 85 boxes ie. 6 boxes wide (for two rows) and top row of 5 boxes (17 boxes per row) and usually 5 rows per cell for a total of 85 boxes. Any wider than six boxes makes it difficult for the loader to reach the centre of the cache to place snow and sawdust on it.
- If different stock types are stored within the same snow cache, they should be assigned to different cells. Changes in stock types within the cache should be differentiated ie. upright 2 x 4's. All snow caches should be mapped indicating location, species, quantities, seed source number, trees per box and arrangement within the snow cache.
- Temperature monitoring equipment should be installed at each snow cache location to provide a record of temperature conditions of the stock. Depending upon the location and access, either mechanical, monthly chart recorders or single point temperature monitors can be used.
- Do not leave sawdust in vehicles overnight, as it clumps. When pre-dumping sawdust place against a snowbank to minimize loss when picking up later.
- If a centralized snow cache is used in successive years, poles, studs, sawdust or woodchips can be re-used; however, used sawdust and woodchips can be frozen, lumpy and difficult to apply.
- Contact the nursery at least two weeks ahead to confirm dates, time and location of the load; check a day before the first load goes out for any last minute changes.
- Do not leave trees exposed to outside air temperature.

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USERS IN NORTHWESTERN ONTARIO

Major users of snow caches in northwestern Ontario include:

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